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Proceedings of the Regional Peer Review Process for the Recovery Potential Assessment for Atlantic Salmon (*Salmo salar*), Southern Newfoundland Designatable Unit (DU)

February 14-16, 2012
St. John's, NL

Chairperson: Ben Davis
Editor: Lee Sheppard

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

In 2010, Atlantic Salmon (*Salmo salar L.)* in rivers within Salmon Fishing Areas (SFAs) 9-12 along the south coast of Newfoundland were concluded to comprise a Designatable Unit (DU), called the South Newfoundland DU, and the population was assessed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; COSEWIC 2010). The Committee identified 16 DUs of Atlantic Salmon with the South Newfoundland population representing DU 4. The DU 4 assessment was based on an estimated important decline in abundance from 1997 to 2007.

A regional advisory process (RAP) meeting was held on February 14-16, 2012 at the Comfort Inn in St. John's, Newfoundland to peer-review information relevant to the recovery potential assessment (RPA) of Atlantic Salmon in the South Newfoundland DU.

The objective of the meeting was to assess the recovery potential of Atlantic Salmon in the South Newfoundland DU. Historic population abundances and trajectories and projections were presented. Population projections were conducted to assess population size after 15 years or three generations in DU 4. The meeting also addressed the major threats to the survival and recovery of South Newfoundland Atlantic Salmon and the limiting factors.

The meeting included participants from Fisheries and Oceans Canada (DFO) Sectors (Science, Ecosystem and Fisheries Management, and Policy and Economics), Aboriginal Groups, Provincial Government representatives, Academia, non-governmental organizations, and stakeholders.

This proceedings report summarizes the relevant discussions and presents the key conclusions reached at the peer review meeting and will be published on the Canadian Science Advisory Secretariat's (CSAS) Website. The details and conclusions of the RPA are provided in a Science Advisory Report (SAR), and supporting information and analyses are detailed in a CSAS Research Document.

Compte rendu de la réunion régionale d'examen par les pairs au sujet de l'évaluation du potentiel de rétablissement (EPR) de l'unité désignable du saumon de l'Atlantique du sud de Terre-Neuve (*Salmo salar*).

SOMMAIRE

En 2010, le Comité sur la situation des espèces en péril au Canada (COSEPAC 2010) a conclu que le saumon de l'Atlantique (Salmo salar L.) dans les rivières, dans les zones de pêche du saumon (ZPS) 9 à 12 situées le long de la côte sud de Terre-Neuve, faisait partie d'une unité désignable, appelée UD du sud de Terre-Neuve, et a désigné la population comme étant menacée. Le COSEPAC a défini 16 UD du saumon de l'Atlantique, la population du sud de Terre-Neuve représentant l'UD 4. L'évaluation de l'UD 4 reposait sur un important déclin estimatif de l'abondance entre 1997 et 2007.

Une réunion portant sur le processus de consultation régionale (PCR) a eu lieu du 14 au 16 février 2012 au Comfort Inn, à St. John's (Terre-Neuve-et-Labrador), afin de permettre l'examen, par les pairs, de l'information pertinente à l'évaluation du potentiel de rétablissement du saumon de l'Atlantique dans l'UD du sud de Terre-Neuve.

La réunion visait à évaluer le potentiel de rétablissement du saumon de l'Atlantique dans l'UD du sud de Terre-Neuve. L'abondance et les trajectoires historiques des populations ainsi que les prévisions quant à celles-ci ont été présentées. Des projections de population ont été faites pour évaluer la taille des populations après 15 ans ou trois générations dans l'UD 4. La réunion a également permis d'étudier les principales menaces à la survie et au rétablissement du saumon de l'Atlantique du sud de Terre-Neuve et les facteurs limitatifs.

Au nombre des participants à la réunion, il convient de mentionner notamment les employés des secteurs des Sciences et de la Gestion des écosystèmes et des pêches de Pêches et Océans Canada (MPO), des membres de groupes autochtones, des représentants du gouvernement provincial, du milieu universitaire et d'organismes non gouvernementaux, ainsi que des intervenants.

Le présent compte rendu résume les discussions pertinentes et présente les conclusions importantes tirées de la réunion. De plus, le compte rendu sera publié sur le site Web du Secrétariat canadien de consultation scientifique (SCCS). Les détails et les conclusions de l'évaluation du potentiel de rétablissement figurent dans un avis scientifique (AS) et les renseignements et les analyses à l'appui sont détaillés dans un document de recherche du Secrétariat canadien de consultation scientifique.

WORKING PAPER ABSTRACTS AND DISCUSSION SUMMARIES

STATUS AND TRENDS PRESENTATION

Presenter: Martha Robertson, DFO Science, Newfoundland and Labrador Region

ABSTRACT

The status of South Newfoundland Atlantic Salmon Designatable Unit (DU 4) was assessed over the previous three generations (1996-2010) using monitoring facility and recreational fishery data. The most recent estimate of adult salmon abundance in DU 4 was 22,404 in 2010, which represented a 42.4 % decline since 1995. Declines occurred within each of the SFAs 9-12 of DU 4; however, declines were greatest and statistically significant only in SFA 11. Over the previous three generations, the overall conservation requirement for DU 4 was achieved in 4 years (27 %) and the Pre-Decline Mean (1981-95) was achieved twice (13 %). Marine survival rates (smolt to small adult salmon) vary among monitored rivers in DU 4 and range from 3.5 % to 5.1 %. Survival rates have declined by 61.6 % since 1988 for Conne River, remained relatively stable for Northeast Brook (Trepassey) since 1987 (decreasing slightly by 18 %) and increased on Rocky River since 1991 (33.5 %).

DISCUSSION

Generation time is measured from spawning to spawning which is five years. The estimates of abundance are based on angling catches adjusted using exploitation rates from southern Newfoundland rivers with monitoring facilities, without adjustments for effort or management changes. Conservation Requirements (CR) were calculated for SFA 9 to 12 and were based on defined egg deposition rate requirements for Fluvial and Lacustrine habitat.

Data presented for DU 4 included each SFA individually, two rivers in SFA 11 and two rivers in SFA 9 in terms of pre-decline mean (1981-95) and CR for small, large, and total numbers of salmon. It was noted that the status of salmon in DU 4 is highly influenced by the status of salmon in SFA 11.

Data from hook and release is compiled from angler log books and a telephone survey. There are concerns that this type of data may not always be reliable (i.e., some salmon may be caught and released multiple times). There was also a discussion on the angling data, reviewing the rod days and catch per effort, and whether the data should be adjusted for effort as well as a change in management (i.e., class change in 1999 from class 1 to class 3; 6 vs. 2 salmon). The total catch had been looked at previously (i.e., in the COSEWIC assessment) and there was no change in terms of the trends in this recent assessment. The comment was made that the south coast is remote and the number of angling logs returned is not high.

Concerns were expressed regarding the lack of Aboriginal Traditional Knowledge (ATK) input in the COSEWIC report. It was stated that the COSEWIC process has since been modified to add ATK; however, this was after the Atlantic Salmon COSEWIC report had been finalized. Aboriginal Traditional Knowledge is now embedded into all new COSEWIC reports.

The definition of recovery was debated around the table. Is a stop in decline (flat line) sufficient or should a return to historical levels be aimed for? There are two components that need to be considered for recovery: 1) maximize the juvenile output; and 2) maximize production of adult fish for social and economic benefits. The COSEWIC works with mature individuals, therefore, the SAR needs to be structured or worded that way.

There was discussion on the level of the Conservation Requirement and what would be considered a recovery. The definition of recovery for the purposes of the *Species at Risk Act* is

to define a level where the population is at minimal risk of decline to extirpation. DFO Ecosystem and Fisheries Management will make decisions using science advice. Science advice should be consistent with that given under the precautionary approach, identifying the risk of the stock declining to a point from which recovery is difficult or not possible.

Questions arose surrounding the decline rate for species listed as endangered by COSEWIC. This rate depends on if there is a known cause or not. If the cause is unknown then the rate of decline of 50 % causes a species to be listed as endangered.

There were concerns over the fact that Conne River marine survival, defined as the number of smolts that leave the river and the number of adults returning to that river, has decreased the most of the three rivers that are monitored in this DU. Marine survival was also discussed for Northeast Brook and Rocky River. Some participants felt that the decline in Conne River may be due to some localized factor.

There was discussion on tagging studies that had taken place in the Conne River area and other tagging studies that could take place. It was suggested that a data gap exists and that there is information that could be gained with tagging studies.

Catch and effort data continues to pose a challenge and its applicability for use in population abundance is a concern. For this analysis it was required that SFAs be grouped together and when this is done, trends may be seen in an area that do not reflect what is occurring on individual river(s).

Exploitation rates are known only for monitored rivers. It was suggested that catchability standardize to unit effort, should be calculated and this value used to estimate abundance from annual recreational fishery catch and effort data.

Questions arose surrounding the St. Pierre et Miquelon coastal Atlantic Salmon fishery (professional and recreational) which uses gillnets and is considered a potential threat to salmon in DU 4. Work is ongoing to identify the origin of the salmon in the catch using genetic analysis tools.

While several concerns on available data were put forward; recommended further analysis of recreational data and a high reliance on angling statistics, it was recognized that this group would be putting forward science advice that is based on currently available data (albeit limited).

It was noted that the COSEWIC process is flexible and species information can be reviewed again when new data becomes available.

POPULATION VIABILITY ANALYSIS OF SOUTH NEWFOUNDLAND ATLANTIC SALMON

Presenter: Laura Weir, Contractor, DFO Science, Newfoundland and Labrador Region

ABSTRACT

Population projections were conducted to assess population size after 15 years or three generations in DU 4. Stochastic models were constructed using current population parameters estimated from 1996 to 2010 for freshwater productivity, ocean mortality, age at maturation, the probability of repeat spawning and total removals from both retention and release angling fisheries. Both ocean mortality and total removals from angling were varied to compare different scenarios that may affect survival of both small and large adult salmon. Current angling exploitation rates were estimated at 12 % as a result of retention of small salmon and 2 % and 1 % for incidental mortality associated with catch and release angling for small and large salmon, respectively. In addition, ocean mortality was varied from an average of 93 % to 98 %

to explore the relative impact of ocean mortality and different angling pressures on population size and the probability of recovery. Two recovery objectives were used: the conservation requirement (30,852) for the DU and the pre-decline (1981-95) mean abundance (42,792) for the DU. Probabilities of achieving these objectives were highest when ocean mortality was low and no fishing occurred.

DISCUSSION

There was a discussion of the model parameters. It was suggested that the model be run using a lag for t+5 rather than t+1 as this reflected the appropriate lag for the mean smolt age in this population. For these stocks, which are 1-sea-winter (1SW) salmon predominantly, 2SW salmon are not considered.

It was requested the stock-recruit data and analysis used to create the values being discussed be presented. This was presented with further discussion on model parameters. With changes in the parameters, the Population Viability Analysis (PVA) was to be redone and revisited once the analysis was complete. The PVA was redone using the both Ricker and Beverton-Holt stock and recruitment relationships to model the egg to smolt production dynamic. The number of smolts produced per spawner in the absence of density-dependent effects (slope at the origin) ranged from 32 to 40 depending on the model. A table was presented of the information and it was discussed how it should be presented in the SAR and Research Document.

The model was run to determine the probabilities of recovery and of stopping further decline. It was decided at the meeting to perform projections to estimate the probability of:

a) maintaining current population levels, i.e., stop the decline;

b) achieving the conservation limit for the DU; and

c) achieving abundance at the pre-decline mean, for different fishery management scenarios.

It was agreed among the group to use 96 % at sea mortality as it would be the most realistic given the recent decade of return rates to the monitored rivers in this DU.

A discussion focused on potential present day threats to Atlantic Salmon in this DU. Some participants felt very strongly that the current Threats Table was insufficient. It was decided to go through the table and add or modify the list of specific threats.

There was a discussion on the sources of uncertainty within the analysis undertaken. The uncertainties regarding the population abundance in DU 4 are not incorporated in the projections and this should be noted. The use of the freshwater model will be implemented as part of the advice process however all the associated limitations/uncertainty would be documented in the SAR.

SUMMARY AND DISCUSSION – DAY 2

The recreational fishery, management, and the removals (St. Pierre et Miquelon fishery, Greenland, and the high seas) were discussed. It was noted that the International Council for the Exploration of the Sea (ICES) report has a good description of the St. Pierre et Miquelon and Greenland fisheries and would be a good source of information.

Participants felt there was a need to develop a table to describe all sources of removals; including St. Pierre et Miquelon fisheries, Greenland and Canadian fisheries. This would include sections on recreational, marine (St. Pierre et Miquelon, West Greenland), and aboriginal and resident fisheries of Labrador.

The value for catch and release mortality in the model is 10 %. Discussion took place around the effects of changing the recreational fishery to catch and release only. These types of scenarios would be useful from a management perspective.

Quantifying illegal fishing is a challenging task. There are statistics on the number of violations and the number of fish taken but it is unknown what percentage this is of the total illegal fishing which occurs. There are DFO reports that attempt to quantify illegal removals, however the methodology was not described or presented during this meeting.

With respect to information on by-catch in other fisheries there is a research document (Dempson et al. 1998 Res Doc 1998/114) which looked at a number of fisheries and other sources of salmon removals; it is a comprehensive report and may prove to be useful. The comment was made that it would also be useful to know if changes have occurred since the report was published (e.g., cod fishery) and to put removals in context to past and current removals for this DU.

The question was raised regarding what is known about predation on the south coast. Given environmental changes that have occurred, predation may have changed. Some examples put forth by participants were increased sightings of seals, sharks, and tuna. However, no quantifiable effects of these potential predators are known.

Two models were presented with 32 and 40 smolts per spawner as the slope at the origin. Including the range of values was considered by participants to be useful for managers. The probability of reaching the pre-decline mean under current fisheries management conditions is 35 % versus 50 % with no recreational fishing. Participants felt it would be useful to DFO management to show them the results of fishing versus no fishing with and without catch and release.

SUMMARY AND DISCUSSION – DAY 3

There was a review of a table showing the model probabilities and a suggestion to change the title using percents. Three scenarios were assessed in the PVA:

1) current recreational fisheries – retained and release;
2) no recreational fishing; and
3) catch and release fishing only.

There was discussion around the model being used and understanding the variables. Was there oscillation around 96 ± 2 % mortality? It was felt that 96 % is the most realistic for the next 15 years. There was concern that the conclusion on survival was solely based on Conne River; however, it was shown that all three rivers have similar survival rates. It was suggested that survival should be the focus instead of mortality and it should be clear that marine fishing is included.

Caution was noted with respect to no-fishing meaning closures as it is important to take into account illegal fishing that may occur as a result of such decisions.

There was discussion on whether changes in survival were possibly happening closer to/in home waters. Is there anything to suggest that natural survival rate is different on the south coast than on the northeast coast? The issue is that the information cannot be partitioned into those sources of mortality. However, survivorship has always been lower on south Newfoundland stocks. It was reiterated that the focus is on the past 15 years and the next 15 years.

It was suggested that it may be possible that on certain parts of the northeast coast there is a good return of repeat spawners whereas, on the south coast there are not a lot of repeat spawners. The south coast is the only area that declined in abundance; however, illegal fishing is not likely to be higher along the south coast than other areas. There may be a reduction in large fish or lack of repeat spawners if the fish are hanging around the bay and the seals are able to catch them.

There were questions on habitat use; does it include the marine environment as well as the freshwater, and does habitat also include water quality? The fact that salmon smolt may be spending 40 days in the estuary before entering the open ocean was noted. It was expressed that fishing mortality is not what is driving this population down; therefore, marine habitat must come into play. It might be food related, salinity, temperature, etc. It was noted that habitat should be highlighted in the report and a bullet drafted for inclusion in the SAR.

There will be a table in the SAR which includes all threats such as aquaculture sites, parasites, and water quality.

Some participants expressed concern that listing factors to marine survival for this DU as illegal fishing, mixed stock fisheries, by-catch, etc. (factors impacting all other NL salmon stocks), would not highlight that there is something unique to this area potentially impacting marine survival. Marine survival in DU 4 is approximately 4 %, whereas the northeast coast is seeing 8 % survival. It was suggested that smolt fitness, quality of the marine habitat or aquaculture sites are possible factors contributing to the low marine survival in the South Newfoundland DU.

It was stated that the aquaculture industry does have data on temperatures and ice conditions throughout the entire year and these conditions have been changing. These data can be made available to DFO.

Again there was concern raised on whether all the conclusions were based on Conne River data? It was stated that conclusions are based on all of the information available and that issues with the data will be highlighted in the SAR. Data will be made available in the Research Document as an appendix.

It was agreed to replace the phrase Conservation Requirement with Conservation Limit throughout the SAR.

PROPOSED RESEARCH RECOMMENDATIONS:

AQUACULTURE – WILD-FARMED INTERACTIONS

This research should be targeted to genetic, behaviour, oceanographic and habitat aspects of understanding wild-farmed salmon interactions on the south coast. Baseline information regarding wild Atlantic Salmon populations in areas potentially impacted by the expansion of the aquaculture industry will also be critical.

TAGGING STUDIES

Tagging studies should be considered to better understand at sea survival, behaviour of smolts in estuaries, and movement of wild fish in relation to aquaculture sites in Fortune Bay and Bay D' Espoir.

OTHER RECOMMENDED STUDIES

- Epidemiological modelling of various pathogens (fish health) should be undertaken.
- Collect genetic information to evaluate the level of genetic divergence among salmon populations in rivers of the DU (i.e., toward scientifically defensible conservation units).
- Exploration of angling catch statistics to further refine abundance estimates.

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APPENDIX 1: MEETING AGENDA

Regional Peer Review Process for Recovery Potential Assessment of Atlantic Salmon, Southern Designatable Unit (DU)

Comfort Inn, 106 Airport Road, St. John's, NL

February 14-16, 2012

Chairperson: Dr. Ben Davis

Tuesday, February 14

Time	Description	Presenter
0900-0920	Presentation on CSAS Process	B. Davis (Chair)
0920-1020	Status and Trends Presentation and Discussion	M. Robertson
1020-1040	*BREAK*	
1040-1200	Status and Trends Discussion	Plenary (all)
1200-1300	*LUNCH*	
1300-1430	Projections Presentation and discussion	L. Weir
1430-1450	*BREAK*	
1450-1630	Discussion continued	Plenary (all)

Wednesday, February 15

Time	Description	Presenter
Morning	Review of draft SAR and finalization	Plenary (all)
TBD	*LUNCH*	
Afternoon	Review of draft SAR and finalization	Plenary (all)

Thursday, February 16

Time	Description	Presenter
Morning	Review of draft SAR and finalization	Plenary (all)
TBD	*LUNCH*	
Afternoon	Review of draft SAR and finalization	Plenary (all)

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APPENDIX 3: TERMS OF REFERENCE

Recovery Potential Assessment Atlantic Salmon (*Salmo salar*), Southern Newfoundland Designatable Unit (DU)

Regional Peer Review Meeting – Newfoundland and Labrador Region

February 14-16, 2012 - St. John's, NL

Chairperson: Dr. Ben Davis

Context

When the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designates aquatic species as threatened or endangered, Fisheries and Oceans Canada (DFO), as the responsible jurisdiction under the *Species at Risk Act* (SARA), is required to undertake a number of actions. Many of these actions require scientific information on the current status of the species, population or designable unit (DU), threats to its survival and recovery, and the feasibility of its recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for the consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

The COSEWIC has designated the Atlantic Salmon, Southern Newfoundland DU (November 2010) as Threatened. This DU is not currently listed under the *Species at Risk Act* (SARA).

In support of listing recommendations for Atlantic Salmon by the Minister, DFO Science has been asked to undertake an RPA, based on the National Frameworks (DFO 2007a and b). The advice in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA. The advice generated via this process will also update and/or consolidate any existing advice regarding Atlantic Salmon, South Newfoundland Population, Southern Newfoundland DU.

Objectives

To assess the recovery potential of Atlantic Salmon, South Newfoundland Population, Southern Newfoundland DU.

Assess current/recent species/ status

1. Evaluate present status for abundance and range and number of populations.
2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on matures) and range and number of populations.
3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.
4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005).
5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton et al. 2007).
6. Evaluate residence requirements for the species, if any.

Assess the Habitat Use

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.
8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.
9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.
10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.
11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.
12. Provide advice on how much habitat of various qualities / properties exists at present.
13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.
14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.
15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.
16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.

Scope for Management to Facilitate Recovery

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.
18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.
19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.
20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

Scenarios for Mitigation and Alternative to Activities

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).
22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).
23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.
25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.
26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

Allowable Harm Assessment

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Document(s)

Participation

- DFO Sectors (Science, Ecosystems and Fisheries Management, Habitat, and Species at Risk, Policy and Economics)
- Aboriginal Communities
- Provinces
- Academia
- Non-governmental organizations and other stakeholders